

**REMARKS**

The applicants thank the examiner for acknowledging applicants' claim for foreign priority and reception of the certified copy of the foreign priority document that was submitted on 5 May 2005.

Claims 1-4, 7 and 9-10 have been canceled without prejudice or disclaimer. Claims 5, 8 and 11 have been amended. Claims 5-6, 8 and 11-14 are currently pending. The applicants respectfully request reconsideration and allowance of this application in view of the above amendments and the following remarks.

Claim 11 was objected to due to the misspelling of the word "desalter." The applicants have accordingly amended claim 11 so that this word is spelled correctly. Therefore, the objection to claim 11 should be withdrawn.

Claims 5, 8 and 11 were rejected under 35 U.S.C. 112, second paragraph as being indefinite and/or under 35 U.S.C. 101 for not setting forth steps involved in a process. The applicants respectfully request that this rejection be withdrawn for the following reasons.

The previous versions of claims 5 and 8 provided for use of a quaternary ammonium compound without setting forth any steps involved in a process. Claims 5 and 8, as amended, now recite method steps of preparing the quaternary ammonium compound and adding it to fluid or water.

Similarly to claims 5 and 8, the previous version of claim 11 provided for use of ( $\beta$ -hydroxyethyl) trimethylammonium hydroxide without setting forth any steps involved in a process. Claim 11, as amended, now recites method steps of preparing ( $\beta$ -hydroxyethyl) trimethylammonium hydroxide and adding the ( $\beta$ -hydroxyethyl) trimethylammonium hydroxide to the desalted crude.

Therefore, because claims 5, 8 and 11, as amended, recite definite steps involved in a process, it is respectfully requested that the rejection of claims 5, 8 and 11 under 35 U.S.C. 112, second paragraph, and/or under 35 U.S.C. 101 be withdrawn.

Before discussing the prior art in detail, it is believed that a brief review of the invention, as claimed, would be helpful. As discussed in the background, it is necessary to appropriately control the pH at various points of equipment such as boilers, gas turbine facilities, steam generators of pressurized water reactors, petrochemical plants, etc. in order to prevent metal corrosion. For example, in a boiler, carbonic acid produced when carbonates and hydrogen carbonates contained in water decompose can lowers the pH in the vapor/condensed water system, and thereby cause corrosion. Similarly, a steam generation unit may become contaminated with acid components including inorganic acid and organic acid which lower the pH at various points and cause corrosion. In petroleum refining and petrochemical processes, acid components contained in crude oil can dissolve in water generated within or at the top of a distillation column or fractionating column or the like, and cause corrosion of the metal of the unit.

Previous approaches to dealing with the above problems include: (1) adding sodium hydroxide to the crude oil at the desaltor outlet so that magnesium chloride and calcium chloride in the crude oil is converted to stable (not hydrolyzing even when heated) sodium chloride, thereby preventing formation of hydrogen chloride; and (2) adding alkanolamines to the crude oil at the desaltor outlet to neutralize the generated hydrogen chloride.

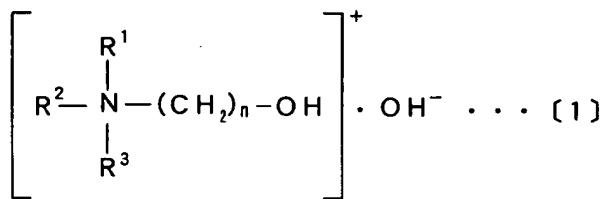
In the first approach care must be taken regarding the amount of the sodium hydroxide added because if too much sodium hydroxide is added, the sodium can deteriorate the catalysts in the heavy oil direct desulfurization unit at a subsequent stage. In fact, it has been found that after

a crude oil refining unit was operated continuously for two years or more, catalyst in the heavy oil direct desulfurization unit which had deteriorated due mainly to sodium from the sodium chloride had to be changed once a year.

The second approach has the drawback of causing problems such as corrosion, line blockage or the like within the unit if the operating temperature of the top of the atmospheric distillation column is lower than the melting point of the amine hydrochlorides produced by neutralization.

Claims 5-6 were rejected under 35 U.S.C. 103(a) as being unpatentable over JP Publication No. 2002-129366A to Shimura in view of U.S. Patent No. 7,279,089 to Vercammen. The applicants respectfully request that this rejection be withdrawn for the following reasons.

Claim 5 recites the novel method described, for example, on pgs. 18-21 for preventing corrosion of metal in a steam generating unit described. The method includes preparing a quaternary ammonium compound described by general formula [1] below:



(wherein R<sup>1</sup>, R<sup>2</sup> and R<sup>3</sup> are the same or different hydrocarbon radicals with 1 to 4 carbon atoms, and n is an integer between 1 and 10), and adding the quaternary ammonium compound to water which may contact the inside of the steam generating unit.

Because the quaternary ammonium compound has a high degree of dissociation and is strongly neutralizing in comparison with the ammonia and neutralizing amines used as conventional pH controllers, and is likely to remain in the boiler due to its relatively low

volatility, it can efficiently prevent corrosion even when added in small quantities. Consequently, by adding the metal corrosion inhibitor or quaternary ammonium compound to a water system, it is possible to efficiently neutralize and prevent corrosion.

Shimura describes adding an amine to feed water of a boiler. However, as conceded by the examiner, Shimura does not describe adding the quaternary ammonium compound recited in claim 5 to the water. The examiner has cited Vercammen in order to cure the deficient teachings of Shimura.

Vercammen describes a method for preventing corrosion caused by ammonium chloride and ammonium sulphates formed or present in crude oil refinery processes. Although Vercammen describes using choline or a derivative thereof as an additive, the applicants respectfully submit that one skilled in the art would have no reason to combine the method of preventing corrosion of the inside of a boiler described in Shimura with the method of preventing corrosion in the crude oil atmospheric distillation unit described in Vercammen. It can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does. KSR International Co. v. Teleflex Inc., (550 U.S. \_\_\_, No. 04-1350, decided April 30, 2007). The examiner contends that both references are concerned with solving a problem of similar technical difficult, namely the prevention of corrosion of metal surfaces by the quenching of corrosive acids with amines. However, the examiner should recognize that Vercammen describes use of choline or a derivative thereof as an additive for solving corrosive problem that are particular to the oil refinery process. The corrosion described in Vercammen results from ammonium chloride and ammonium sulphates which are generated during the oil refinery process. The corrosion environment of a boiler such as described in Shimura is completely different from that of the oil refinery process. Therefore, one skilled in the art would have no reason to combine the method

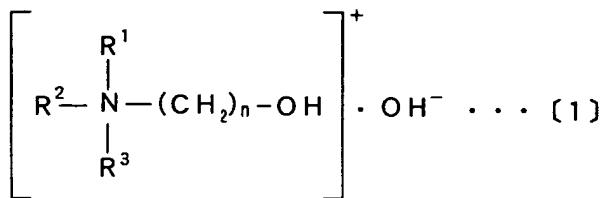
of preventing corrosion of the inside of a boiler described in Shimura with the method of preventing corrosion in the crude oil atmospheric distillation unit described in Vercammen as asserted by the examiner.

A *prima facie* case of obviousness is rebutted by proof of unexpected or superior results. (See MPEP 2144.09 Aug. 2001). As discussed above and on pg. 20, because the quaternary ammonium compound recited in claim 5 has a high degree of dissociation and is strongly neutralizing in comparison with the ammonia and neutralizing amines used as conventional pH controllers, and is likely to remain in the boiler due to its relatively low volatility, it can efficiently prevent corrosion even when added in small quantities. In comparison, Shimura merely describes adding an amine to feed water of a boiler. Thus, assuming *arguendo* that one skilled in the art would have a reason to combine the method of preventing corrosion of the inside of a boiler described in Shimura with the method of preventing corrosion in the crude oil atmospheric distillation unit described in Vercammen as asserted by the examiner, such a combination would not achieve the advantages of efficiently preventing corrosion even when added in small quantities.

In conclusion, one skilled in the art would have no reason to combine the method of preventing corrosion of the inside of a boiler described in Shimura with the method of preventing corrosion in the crude oil atmospheric distillation unit described in Vercammen, and the combination does not achieve the advantages of efficiently preventing corrosion even when added in small quantities. In view of this conclusion, it is respectfully requested that the rejection of claim 5, as well as dependent claim 6, under 35 U.S.C. 103(a) be withdrawn.

Claim 8 was rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,965,785 to Braden *et al.* in view of U.S. Patent No. 7,272,089 to Vercammen. The applicants respectfully request that this rejection be withdrawn for the following reasons.

Claim 8 recites the novel method described, for example, on pgs. 21-2, for preventing corrosion of metal in an atmospheric distillation column for petroleum refining process. The method includes preparing a quaternary ammonium compound described by general formula [1] below:



(in which  $\text{R}^1$ ,  $\text{R}^2$  and  $\text{R}^3$  are the same or different hydrocarbon radicals with 1 to 4 carbon atoms, and  $n$  is an integer between 1 and 10), and adding the quaternary ammonium compound to fluid which may contact the inside of the atmospheric distillation column for petroleum refining process such that a pH value thereof at the top line of the atmospheric distillation column is 5.5-6.5.

Braden, on the other hand, merely describes a process of adding amines to a liquid that comes in contact with an atmospheric pipestill tower. However, as conceded by the examiner, Braden does not describe adding the quaternary ammonium compound recited in claim 8 to the water. The examiner has cited Vercammen in order to cure the deficient teachings of Braden.

Vercammen describes a method for preventing corrosion caused by ammonium chloride and ammonium sulphates formed or present in crude oil refinery processes.

As discussed on pg. 23, because quaternary ammonium compound A is more strongly basic than ammonia and neutralizing amines as the conventional pH controllers, it can effectively prevent corrosion even when added in small quantities. Consequently, by adding the metal corrosion inhibitor or quaternary ammonium compound as recited in claim 8 to fluid which may contact the inside of a petroleum refining or petrochemical process unit, it is possible to efficiently prevent corrosion of metals of the unit. Braden and Vercammen fail to achieve this advantage. A *prima facie* case of obviousness is rebutted by proof of unexpected or superior results. (See MPEP 2144.09 Aug. 2001).

Moreover, the applicants question the examiner's conclusion that one skilled in the art would have a reason to modify the process of adding amines to a liquid described in Braden to make use of the choline or a derivative thereof described in Vercammen. As shown in Table 5 of the description of the present application, neither monoethanolamine nor dimethylethanolamine exhibited any hydrogen chloride formation inhibiting effect or hydrogen chloride neutralizing effect. That is, not all amines can exhibit corrosion inhibiting effect in the crude oil atmospheric distillation unit. Therefore, one skilled in the art would not have a reason to use the chorine described in Vercammen in the process described in Barden instead of the described amines (sec-butylamine, 2-amino-1-methoxypropane) due to the unpredictability of amines.

Therefore, because Braden and Vercammen fail to teach or suggest adding the quaternary ammonium compound recited in claim 8 to the fluid, and because one skilled in the art would have no reason to modify the process of Braden as asserted by the examiner, it is respectfully requested that the rejection of claim 8 under 35 U.S.C. 103(a) be withdrawn.

Claims 11-14 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,965,785 to Braden *et al.* in view of U.S. Patent No. 7,272,089 to Vercammen. The applicants respectfully request that this rejection be withdrawn for the following reasons.

Claim 11 recites the novel embodiment described, for example, on pg. 24 of a method for inhibiting formation of hydrogen chloride in a crude oil atmospheric distillation unit, including preparing ( $\beta$ -hydroxyethyl) trimethylammonium hydroxide and adding the ( $\beta$ -hydroxyethyl) trimethylammonium hydroxide to the desalted crude oil in between the crude oil desalter and the main distillation column in the crude oil atmospheric distillation unit.

As conceded by the examiner, Braden does not describe adding the ( $\beta$ -hydroxyethyl) trimethylammonium hydroxide to the desalted crude oil as recited in claim 11. The examiner has cited Vercammen in order to cure the deficient teachings of Braden.

Vercammen describes a method for preventing corrosion caused by ammonium chloride and ammonium sulphates formed or present in crude oil refinery processes. However, Braden and Vercammen fail to achieve this advantage of efficiently prevent corrosion of metals of the unit even when the ( $\beta$ -hydroxyethyl) trimethylammonium hydroxide is added in small qualities. Moreover, one skilled in the art would not have a reason to use the chorine described in Vercammen in the process described in Barden instead of the described amines (sec-butylamine, 2-amino-1-methoxypropane) because of the generally unpredictable nature of amines.

Accordingly, it is respectfully requested that the rejection of claim 11, as well as dependent claims 12-14, under 35 U.S.C. 103(a) be withdrawn.

In view of the foregoing, the applicants submit that this application is in condition for allowance. A timely notice to that effect is respectfully requested. If questions relating to patentability remain, the examiner is invited to contact the undersigned by telephone.

If there are any problems with the payment of fees, please charge any underpayments and credit any overpayments to Deposit Account No. 50-1147.

Respectfully submitted,

  
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